EXECUTIVE SUMMARY

Cost Allocation Study for the Montana State Highway System:
1999 Update

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The objective of this study was to review revenues and expenditures for the state highway system in Montana to determine if the various users of the system were equitably sharing the costs of providing them with highway service. This study was an update of the 1992 cost allocation study, and it was conducted in light of several changes that have occurred since that study with respect to the funding and use of the highway system. These changes include revisions in fuel tax rates, adoption of a new basis and schedule for levying motor carrier fees, changes in patterns of vehicle use, changes in expenditure patterns, and improvements in the data and methodologies available to support cost allocation studies. The study was based on historical revenues and expenditures in the period 1994 to 1996. During this period, an average of $271,267,000 in revenue was collected annually from system users to be used on the highway system, while an average of $320,842,000 was spent each year to provide these users with highway service. State funds accounted for 66 and 52 percent, respectively, of the revenues and expenditures on the state highway system. The remaining revenue was collected by the federal government, and the remaining expenditures were funded from the federal Highway Trust Fund. Note that average annual expenditures exceeded programmed highway revenues by 18 percent during the study period. While state revenues and expenditures were on the same order of magnitude each year, the federal government spent an average of 68 percent more money on federal aid highways in Montana than they collected in highway revenue from the users of this system. While the 1992 study treated only state derived revenue and subsequent expenditures of this revenue on the highway system, this study was expanded to also include an analysis of federal funds collected and used on the state highway system in Montana.

The steps required to accomplish the objectives of this study consisted of:

1) allocating the revenue used to fund the highway system back to the vehicles from which it was collected,
2) allocating the costs of providing highway service back to the vehicles whose demands occasioned them, and
3) comparing these allocated revenues and allocated costs to determine if highway users have been equitably sharing the expense of providing them with highway service.

This approach to assessing equity of user fee payments, referred to as the "cost occasioned" approach to highway cost allocation, is the most commonly used approach for performing such studies (and it was the primary approach used on the recent federal cost allocation study). The revenues considered in these analyses consisted only of revenues subsequently used to fund construction, operation, or maintenance of the state highway system. The expenditures considered in these analyses were the direct agency costs incurred during each year of the study period; external costs associated with the existence and use of the highway system (costs of

congestion, environmental impacts, etc.) were not included in this study. While these external costs may be significant, they presently can not be calculated with sufficient confidence to include them in this study.

With respect to state revenues used to fund the highway system, personal vehicles (automobiles and pickups), single units (trucks and busses), and combination trucks were found to be responsible for 65, 9, and 26 percent of this revenue. State funds used on the highway system came almost exclusively from user taxes and fees. Sources of state highway revenues included fuel taxes (81 percent), weight fees (12 percent), new vehicle sales tax receipts (5 percent), and other miscellaneous fees and disbursements (2 percent). Records available on these revenues generally consisted of the total revenue collected, with only nominal information on their source by vehicle type. Thus, the revenue allocation process consisted of using any information that was available on revenue by vehicle type, in conjunction with knowledge of the basis upon which the taxes and fees were levied, to estimate fee payments by vehicle class.

Personal vehicles, single units, and combination trucks were found to be responsible for 51, 9, and 40 percent of federal highway revenue attributable to Montana. Sources of federal highway revenues were similar in type to those of the state, and included fuel taxes (81 percent), truck and trailer sales taxes (12 percent), heavy vehicle use taxes (5 percent), and tire taxes (3 percent).

With respect to expenditures on the highway system, personal vehicles, single units, and combination trucks were found to be responsible for 67, 8, and 25 percent of expenditures of state funds on the system. State funds were used on all the activities associated with constructing, maintaining, and operating the state highway system, including general operations (6 percent), construction (41 percent), maintenance (37 percent), highway patrol (10 percent) bond interest (4 percent) and other miscellaneous activities (2 percent). The expenditure allocation process consisted of using engineering and other principles to relate physical demands from specific vehicles to certain features of the highway system (e.g., heavy trucks and thicker pavements), and then assigning costs to these features of the system.

Personal vehicles, single units and combination trucks were found to be responsible for 59, 6, and 35 percent of the expenditures of federal funds on the state highway system. These federal cost responsibilities differ from those of the state because federal funds, by law, were restricted to funding construction activities.

The revenue and expenditure allocations given above were used to calculate equity ratios for the different classes of vehicles that use the highway system. These equity ratios were defined as the percent of allocated revenues for a vehicle class divided by the percent of allocated expenditures. Thus, an equity ratio greater than one indicated that a group of vehicles was overpaying their cost responsibility relative to the other vehicles in the traffic stream (percent of revenue exceeds percent of expenditures), while an equity ratio less than one indicated that they were underpaying their cost responsibility relative to other vehicles in the traffic stream (percent of revenues less than percent of expenditures).

Following the equity ratio approach, users of the state highway system were generally found to be paying their fair share of the costs of providing them with highway service. Equity ratios of 0.96, 1.17, and 1.04 were calculated for personal vehicles, single units, and combination trucks, respectively, for state revenues and expenditures on the highway system. These ratios range closely around 1.00; they indicate that personal vehicles were nominally under paying the relative costs of providing them with highway service, while single units and combination trucks were nominally over paying the relative costs of providing them with highway service. Greater

disparities in equity were observed between the individual vehicle classes within the broad categories of personal vehicles, single units, and combination trucks. Within the category of personal vehicles, the equity ratios for automobiles and pickups were 0.86 and 1.14, respectively, indicating automobiles were relatively under paying their relative cost responsibility while pickup trucks were over paying their cost responsibility. Within the category of single units, 3 and 4+ axle single units were found to be significantly over paying their relative cost responsibility, with equity ratios of 1.85 and 2.13, respectively. Conversely, busses were found to be significantly under paying their cost responsibility, with an equity ratio of 0.42. The equity ratios for combination trucks ranged from 0.81 to 1.88, with the lowest equity ratios calculated for the largest double trailer configurations. Disparities were also observed for individual vehicles of the same configuration operating at different weights. A five axle tractor, semi-trailer registered at 80,000 pounds, for example, was found to have an equity ratio of 0.9 at an operating weight of 80,000 pounds, while its equity ratio increased to 1.2 at an operating weight of 70,000 pounds.

The equity ratios calculated for federal revenues and expenditures for the highway system were 0.87, 1.44, and 1.14, respectively, for personal vehicles, single units, and combination trucks. Federal equity ratios, in general, ranged more widely around 1.00 than state equity ratios. Some of the trends observed in the state equity ratios by vehicle class were also observed in the federal equity ratios, that is, a) automobiles had an equity ratio less than 1.0, while pickups had an equity ratio greater than 1.0, b) large single units (3 and 4+ axle) had equity ratios significantly greater than 1.0, and c) busses had an equity ratio considerably lower than 1.0. Results from this analysis of federal financing of the highway system were compared with those determined by the Federal Highway Administration (FHWA) in their recent federal highway cost allocation study. The equity ratios determined in that study for personal vehicles, single units, and combination trucks were 1.05, 0.86, and 0.95, respectively. While FHWA's results differed from those obtained in this study, it is important in addressing this difference to recognize that all highway users in Montana under pay their federal cost responsibility for highway service. Thus, the equity ratios obtained in this study simply indicate that single units and combination trucks are under paying their cost responsibility less than personal vehicles. Personal vehicles, single units, and combination trucks were found to be under paying their cost responsibility for federal expenditures on the Montana highway system by 0.71, 0.53, and 2.77 cents per mile, respectively.

Equity ratios for combined state and federal funds used on the highway system ranged fairly closely around 1.00 for the broad vehicle classes considered in this study. Equity ratios of 0.95, 1.28, and 1.00 were calculated for personal vehicles, single units, and combination trucks, respectively.

The equity of state highway revenues and expenditures by vehicle class was also investigated using highway cost allocation software being developed by FWHA. Note that only a preliminary version of this software was available at the time of this study. The software is being developed from the analysis algorithms assembled for the recent federal highway cost allocation study. The software uses the same cost occasioned approach to highway cost allocation as was used by Montana State University (MSU) in the analysis described above. The FHWA software was run using the same input data and allocation strategies as were used in the MSU analysis. The FHWA software produced equity ratios of 1.04, 1.00, and 0.91, respectively, for personal vehicles, single units, and combination trucks. As observed in the MSU analysis, these ratios are all clustered closely around 1.0. The primary difference between the MSU and

FHWA results was a consistent shift in the magnitude of the equity ratios with vehicle size. The MSU analysis indicated nominal underpayment of relative cost responsibility by personal vehicles with an equity ratio of 0.96, while the FWHA software indicated a nominal over payment of cost responsibility for personal vehicles with an equity ratio of 1.04. This situation was reversed for combination vehicles, with the MSU and FHWA analyses generating equity ratios of 1.04 and 0.91, respectively, for these vehicles. This difference in results was very specifically traced to differences in the allocation of pavement construction costs on the non-interstate NHS and secondary highway systems. The FHWA analysis uses a new pavement deterioration model developed for the federal cost allocation study. While this model implements a contemporary mechanistic approach to pavement deterioration, the model has not been extensively exercised or evaluated outside of the federal cost allocation effort. Additional work needs to be done to insure that the performance of pavements in Montana is being accurately represented in the FHWA program. Note that considerable work has been done to customize the AASHTO ESAL model of pavement deterioration used in the MSU analysis so that it reasonably represents actual road performance in Montana.

Elimination of the new vehicle sales tax and the implementation of a new light vehicle fee schedule (actions of the 1999 Montana state legislature) were expected to have minimal impacts on the equity and sufficiency of state funds used on the highway system. Other actions, however, that could affect user equity at the state level and that may therefore merit future consideration are a) the increase in construction spending expected under the re-authorized federal highway bill and b) the assumption by the state of responsibility for maintenance activities on the secondary system beginning in the year 2000.